IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

Inventor: Edouard Francois et al.

Application No.:   10/590,307

Filed: June 27, 2007

Title: METHOD OF ENCODING AND DECODING AN IMAGE SEQUENCE

                   BY MEANS OF HIERARCHICAL TEMPORAL ANALYSIS

Examiner: Findley, Christopher G.

Art Unit: 2482

Customer No.:   12905

APPEAL BRIEF

May It Please The Honorable Board:

Appellants initiate a new appeal under 37 CFR 41.27 in response to the Final Rejection, dated April 27, 2011, of Claims 1-12 of the above-identified application. Please charge the required fee of five hundred forty dollars ($540.00) for filing this Brief to Deposit Account 07-0832. Enclosed is a single copy of this Brief.

No additional fee is believed due with this response. However, please charge any additional fee or credit any overpayment to the above-identified Deposit Account.

Appellants do not request an oral hearing.

I.   REAL PARTY IN INTEREST

The real party in interest of Application Serial No. 10/590,307 is the Assignee of record:

Thomson Licensing S.A.

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II.   RELATED APPEALS AND INTERFERENCES

There are currently, and have been, no related Appeals or Interferences regarding Application Serial No. 10/590,307.

III.   STATUS OF THE CLAIMS

Claims 1-12 are rejected and the rejection of claims 1-12 is appealed.

IV.   STATUS OF AMENDMENTS

All previous amendments were entered and are reflected in the claims included in Appendix I.

V.   SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 provides a method for coding a picture sequence (Page 1, lines 5-6). The method includes a hierarchical temporal analysis of a group of pictures performing a motion compensated temporal filtering of successive pairs of pictures to supply low temporal frequency pictures and high temporal frequency pictures at different temporal decomposition levels (Page 3, lines 20-24). This analysis realizes, for a given temporal decomposition level and for a pair of low temporal frequency pictures, a motion estimation operation of a current picture B to a previous reference picture A to supply motion vectors then a motion compensated temporal filtering of these pictures to supply a low temporal frequency picture (L) and a high temporal frequency picture (H) at a greater decomposition level (Page 3, lines 24-30). The temporal filtering is replaced by an intra mode coding to obtain at least one low (L) or high (H) frequency picture if the current picture has a level of correlation with a previous picture lower than a threshold (Page 3, lines 30-33). The low frequency pictures (L) obtained are thus scaled to be adapted, at the energy level, to the pictures obtained by the motion compensated temporal

filtering (Page 3, lines 33-35). Among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis, a selection operation selects the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding (Page 3, line 35 – page 4, line 5). A calibration operation calibrates the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding (Page 4, lines 6-7).

Dependent claim 2 includes all the features of claim 1, wherein the number of reverse operations carried out corresponds to the number of successive intra coding operations of a low frequency picture (L) to arrive at the picture selected if this involves a low frequency selected picture (Page 4, lines 8-11). This number is decreased by one if it involves the high frequency selected picture (H) (Page 4, lines 11-12).

Dependent claim 3 includes all the features of claim 1, including, for the calculation of a low L or high H frequency image at a given temporal level, a temporal filtering between the current picture and a following picture of the following pair of pictures of the lower temporal level (Page 4, lines 13-16). If the correlation between the current picture and the previous picture is lower than a threshold and if the correlation between the current picture and this following picture is greater than a threshold, the other H or L picture of the given temporal level is obtained by intra coding (Page 4, lines 16-19). This filtering operation is assimilated with the intra coding and not with the temporal filtering for the selection operation (Page 4, lines 19-21).

Dependent claim 4 includes all the features of claim 1, including, assigning a picture number to each picture of the group of pictures, and monitoring these numbered pictures during the decomposition by attributing a counter for each number (Page 4, lines 22-25). The counter is increased each time a low frequency picture (L) is obtained in intra mode (Page 4, lines 26-27). The counter remains unchanged each time a high frequency picture (H) is obtained in intra mode or during a temporal filtering with a following picture (Page 4, lines 28-30). The counter is reset each time a picture is obtained by motion compensated temporal filtering with a previous picture

(Page 4, lines 31-32). The reverse operations are carried out according to the value of the counters (Page 5, lines 1-7).

Dependent claim 5 includes all the features of claim 1, wherein the high frequency pictures H and low frequency pictures L are obtained, during the motion compensated temporal filtering of two successive pictures A and B, from the following operations:

$$\begin{cases} H = \dfrac{B - MC_{A \leftarrow B}(A)}{\sqrt{2}} \\ L = \sqrt{2}.A + MC_{A \leftarrow B}^{-1}(H) \end{cases}$$

MC corresponding to the motion compensation according to the B to A motion vector field, of the picture A or H,

and wherein the pictures L and H are obtained, from intra coding, according to the formulas

$$\begin{cases} H = B \\ L = \sqrt{2}.A \end{cases}$$ (Page 8, lines 14-31; page 9, lines 11-14).

Dependent claim 6 includes all the features of claims 1 and 3, wherein the pictures H and L are obtained by filtering with the following picture for H and by intra coding for L, according to the following formulas:

$$\begin{cases} H = \dfrac{B - MC_{B \rightarrow C}(C)}{\sqrt{2}} \\ L = \sqrt{2}.A \end{cases}$$

MC corresponding to the motion compensation according to the B to C motion vector field, of the picture C (Page 9, lines 15-27).

Dependent claim 7 includes all the features of claim 1, wherein the calibrated pictures obtained by temporal analysis are then processed by spatial analysis (Page 13, lines 11-18).

Dependent claim 8 includes all the features of claim 1, wherein the level of correlation is calculated by taking into account the number of connected pixels, that is, connected by a motion vector (Page 2, lines 24-30; page 8, 11-23).

Independent claim 9 provides a decoding method for a sequence of coded images (Page 1, lines 5-6). The coding realizes an intermediate operation of hierarchical temporal analysis of the motion compensated temporal filtering (MCTF) type providing high frequency and low frequency pictures for their coding (Page 5, lines 18-24). The method includes a decoding operation giving high frequency and low frequency decoded pictures (Page 5, lines 18-24). At least one reverse calibration operation for pictures is selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations is dependent on an element of information associated with the coded picture, to provide pictures to synthesize (Page 5, lines 3-7). A temporal synthesis operation for decoded pictures is not selected, said pictures to synthesize (Page 10, lines 27-32; page 13, line 11 – page 14, line 14).

Dependent claim 10 includes all the features of claim 9, wherein the information associated with the coded picture is the value of a counter assigned to the picture during the coding (Page 5, lines 5-7).

Dependent claim 11 provides a coder for the implementation of the method according to claim 1, including a temporal analysis circuit using the motion compensated temporal filtering and the intra coding (Page 5, lines 8-10). The circuit selects, among the low frequency picture and the final high frequency decomposed pictures obtained at the end of analysis, the pictures obtained by an intra coding of a picture at the lower decomposition level, with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding (Page 5, lines 11-16). The circuit carries out at least one scaling operation for the pictures selected (Page 5, line 17).

Dependent claim 12 provides a decoder for the implementation of the method according to claim 9, including a decoding circuit to provide high and low frequency decoded pictures and a temporal synthesis circuit of pictures to synthesize (Page 5, lines 18-20). The decoder also includes means to perform a reverse calibration of selected high and/or low frequency decoded pictures to provide pictures to be synthesized (Page 5, lines 20-21). The selection of the pictures

and the number of reverse calibrations are dependent on an element of information associated with the picture to decode, and received by the decoder (Page 5, lines 21-24).

VI.   GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 9, 10 and 12 are rejected under 35 U.S.C. § 102(e) as being anticipated by Turaga et al. (U.S. Publication No. 2004/0008785 A1), hereinafter "Turaga".

Claims 1-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Turaga et al. (U.S. Publication No. 2004/0008785 A1) in view of Zhang et al. (U.S. Patent No. 7,321,625 B2), hereinafter "Zhang". Although claims 9, 10 and 12 are not discussed in this section, the heading explicitly rejects claims 9, 10 and 12 under these grounds, and claims 9, 10 and 12 will be addressed as though it had been discussed in this rejection.

VII.   ARGUMENT

Appellants respectfully submit that Turaga, when taken individually or in combination with Zhang, neither anticipates nor makes unpatentable the present claimed arrangement. Thus, reversal of the Final Rejection (hereinafter termed "rejection") of claims 9, 10 and 12 under 35 U.S.C. § 102(e) and of claims 1-12 under 35 U.S.C. § 103(a) are respectfully requested.

Overview of the Cited References

Turaga describes a method and device for encoding video. A first region in a first frame is matched to a second region in a second frame. A first partially encoded frame is produced including a difference between pixel values of the first and second region. A second partially encoded frame is produced including pixel values of either the first or second region. Further, the first and second partially encoded frame is transformed into wavelet coefficients (see Abstract).

Zhang describes wavelet based multiresolution video representations generated by multi-scale motion compensated temporal filtering (MCTF) and spatial wavelet transform. A new family of video decomposition processes utilize subband MCTF to generate multi-scale representations along the temporal direction. Since MCTF is performed subband by subband,

motion vectors are available for reduced spatial resolutions, thus facilitating the support of spatial scalability by video coders that use the multiresolution representation in video coding (see Abstract and column 2, lines 13-23).

Rejection of claims 9, 10 and 12 under 35 U.S.C. 102(e)

Reversal of the rejection of claims 9, 10 and 12 under 35 U.S.C. § 102(e) as being anticipated by Turaga et al. (U.S. Publication No. 2004/0008785 A1) is respectfully requested because the rejection makes crucial errors in interpreting the cited reference. The rejection erroneously states that claims 9, 10 and 12 are anticipated by Turaga.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP §2131, citing Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).]

CLAIMS 9, 10 and 12

Independent claim 9 provides a decoding method for a sequence of coded images. The coding realizes an intermediate operation of hierarchical temporal analysis of the motion compensated temporal filtering (MCTF) type providing high frequency and low frequency pictures for their coding. The method includes a decoding operation giving high frequency and low frequency decoded pictures. The method further includes one reverse calibration operation for pictures that are selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations is dependent on an element of information associated with the coded picture, to provide pictures to synthesize. Moreover, the method comprises a temporal synthesis operation from decoded pictures that were not selected and said pictures to synthesize. For the reasons presented below, it is respectfully submitted that Turaga fails to teach or suggest each feature claimed in claim 9 of the present arrangement.

Turaga describes a method and device for encoding video. A first region in a first frame is matched to a second region in a second frame. A first partially encoded frame is produced including a difference between pixel values of the first and second region. A second partially

encoded frame is produced including pixel values of either the first or second region. Further, the first and second partially encoded frame is transformed into wavelet coefficients (see Abstract).

However, unlike the present claimed arrangement, Turaga fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement. The Office Action concedes that Turaga does not specifically disclose a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding. Since the calibration operation is carried out for the selected picture, Turaga cannot have a calibration operation for a picture selected because the prerequisite selection operation is missing in Turaga. Therefore, Turaga does not teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures" as recited in claim 9 of the present arrangement.

Furthermore, Turaga is related to wavelet based coding utilizing motion compensated temporal filtering that produces L-frames with both filtered and unfiltered regions (see Turaga, paragraph [0002]). A first region of a first frame is matched to a second region in a second frame, and a first partially encoded frame is produced including a difference between pixel values of the first and the second region. A second partially encoded frame is produced including pixel values of either the first or the second region (see Turaga, paragraph [0007]). In order to produce a L-frame, Turaga describes a temporal filtering unit which determines for each of the two corresponding matched regions in each pair of frames whether it should be an unfiltered A-region or should be filtered as a L-region. For each of the two corresponding matched regions that is determined to be a L-region, the temporal filtering unit calculates the average of the pixel values of the two regions. According to Turaga, the average of these two regions may be multiplied by a scaling factor, for example, the square root of two (see Turaga, paragraph [0025]).

Thus, according to Turaga, L-regions of L-frames are scaled. The scaling taught by Turaga is applied to regions of frames, independently of picture type. Therefore, Turaga does not teach or suggest a calibration operation for selected pictures.

In addition, cited paragraphs [0040] – [0042] of Turaga state:

An inverse temporal filtering unit 22 is included to reconstruct the partially decoded frames from the spatial recomposition unit 20. During operation, the inverse temporal filtering unit 22 processes each pair of H and L-frames included in each GOP, as follows. First, corresponding regions in each pair of H and L-frames are retrieved according to the motion vectors and frame numbers provided by the entropy decoding unit 16. According to the present invention, each of the corresponding regions retrieved will include either an L-region or a A-region from an L-frame and a region from an H-frame. As previously described, the A-region represents the unfiltered pixel values of one of two corresponding matched regions between a pair of frames, the L-region represents the average of pixel values of the two corresponding matched regions and the region from the H-frame represents the difference between the two corresponding matched regions. Further, each of the retrieved corresponding regions are divided by the same scaling factor used on the encoder side.

For each L-region included in the L-frames, a sum and difference is calculated for the pixel values of each L-region and the corresponding region in the H-frame. Each sum and difference is then divided by another scaling factor. An example of a suitable scaling factor would be a value of two (2). Each scaled sum and difference is then placed in the appropriate reconstructed frame.

For each A-region included in the L-frames, it will be passed along unchanged to the appropriate reconstructed frame after being initially scaled, as described above. As previously described, each L-frame may have an associated header or flag that indicates whether a particular A-region was selected from either a reference frame or source frame. Thus, each A-region may be placed in the appropriate reconstructed frame according to the information in the associated header or flag. Alternatively, the A-region may be placed in the appropriate frame according to a predetermined convention. For example, it could be decided to select all A-regions from a reference frame for the whole video sequence.

Turaga describes a single scaling operation applying the same scaling factor to A-regions and two scaling operations applying the same scaling factor, for example, a value of two (2), to sums and differences calculated for pixel values of each L-region comprised in the L-frame and the corresponding region in the H-frame. Although Turaga describes that each L-frame may have an associated header or flag that indicates whether a particular A-region was selected from either a

reference frame or source frame, such information is only related to which reconstruction frame to place in the A-region. Turaga does not teach or suggest that the number of operations depends on the information in the associated header or flag. Since Turaga does not disclose a selection operation as discussed above, the selection of pictures would not be dependent on an element of information associated with the coded picture. Therefore, Turaga fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

In response to Applicant's arguments submitted in the prior response filed February 17, 2011 and discussed above, the present Office Action merely re-asserts paragraph [0040] of Turaga. The present Office Action argues that Turaga describes "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures" as recited in claim 9 of the present arrangement. Specifically, the present Office Action argues that because in Turaga, only L frames may contain L regions or A regions, the initial selection is between L frames and H frames, with further calibration if the frame selected is an L frame. Appellants respectfully disagree. Indeed, paragraph [0040] of Turaga defines "retrieved regions" as including "either an L-region or an A-region from an L-frame and a region from an H-frame". However, these retrieved regions are scaled (see Turaga, last sentence of paragraph [0040]: "retrieved region are divided by the same scaling factor"). Therefore, regions from an H-frame are also scaled since they are retrieved regions. Consequently, contrary to the assertion in the present Office Action, the scaling is applied to both regions of L and H-frames and not only if the selected frame is an L-frame. Therefore, Turaga fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures" as recited in claim 9 of the present arrangement.

Further, the present Office Action re-asserts that paragraph [0040] of Turaga describes that Turaga does look at pictures in the frames (see Turaga, paragraph [0040]: "During operation, the inverse temporal filtering unit processes each pair of H and L-frames included in each GOP..."). Appellants respectfully disagree. The cited passage does not teach any scaling step.

In addition, the last sentence of paragraph [0040] mentions explicitly that "each of the retrieved corresponding regions are divided by the same scaling factor used on the encoder side." This confirms that the scaling factor taught by Turaga is applied on regions and not to pictures. Therefore, Turaga does not teach or suggest a calibration operation for pictures selected.

In addition, the present Office Action re-asserts paragraphs [0040] and [0042] of Turaga arguing that Turaga describes that the number of operations depends on the information in the associated header or flag and therefore would be dependent on an element of information associated with the coded picture. Specifically, the present Office Action argues that because in Turaga, only L frames may contain L regions or A regions and the A region may be placed in the associated header or flag and since processing the A region requires the extra scaling operation, the selection of the pictures and the number of reverse operations are indeed dependent on an element of information associated with the coded picture in Turaga. Appellants respectfully disagree. The present Office Action does not show that Turaga teaches several reverse calibration steps. Paragraph [0042] simply discloses that each L-frame may have an associated header or flag that indicates whether a particular A-region was selected from either a reference frame or a source frame". This sentence does not state that the A-region is placed in the header or flag. The header or flag in Turaga simply comprises an indication related to A-region but not the region itself. The A-region is clearly not in the header or flag. Therefore, Turaga fails to teach or suggest "the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

Therefore, as Turaga fails to teach or suggest each feature claimed in claim 9, Appellants respectfully submit that Turaga fails to anticipate the present claimed arrangement. Thus, it is further respectfully submitted that a valid prima facie anticipation rejection has not been made and the rejection of claim 9 under 35 U.S.C. § 102(e) is improper and should be reversed.

Claims 10 and 12 are dependent on claim 9 and are considered patentable for the reasons presented above with respect to claim 9. Thus, it is respectfully submitted that the rejection of claims 10 and 12 is improper and should be reversed.

In view of the above remarks, it is respectfully submitted that the Office Action fails to make a prima facie case that the present claimed arrangement as claimed in claims 9, 10 and 12 is anticipated by Turaga. Therefore, as Turaga fails to teach or suggest each feature claimed, it is respectfully submitted that this rejection is improper and should be reversed.

Rejection of claims 1-12 under 35 U.S.C. 103(a)

Reversal of the rejection of claims 1-12 under 35 U.S.C. § 103(a) as being unpatentable over Turaga et al. (U.S. Publication No. 2004/0008785 A1) in view of Zhang et al. (U.S. Patent No. 7,321,625 B2) is respectfully requested because the rejection makes crucial errors in interpreting the cited references. The rejection erroneously states that claims 1-12 are made unpatentable by Turaga in view of Zhang.

The failure of an asserted combination to teach or suggest each and every feature of a claim remains fatal to an obviousness rejection under 35 U.S.C. § 103. Section 2143.03 of the MPEP requires the "consideration" of every claim feature in an obviousness determination. To render a claim unpatentable, however, the Office must do more than merely "consider" each and every feature for this claim. Instead, the asserted combination of the patents must also teach or suggest each and every claim feature. See In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (emphasis added) (to establish prima facie obviousness of a claimed invention, all the claim features must be taught or suggested by the prior art). Indeed, as the Board of Patent Appeals and Interferences has recently confirmed, a proper obviousness determination requires that an Examiner make "a searching comparison of the claimed invention - including all its limitations - with the teaching of the prior art." See In re Wada and Murphy, Appeal 2007-3733, citing In re Ochiai, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis in original). "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious" (MPEP §2143.03, citing In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)).

<u>CLAIMS 1-8 and 11</u>

Independent claim 1 provides a method for coding a picture sequence. The method includes a hierarchical temporal analysis of a group of pictures performing a motion compensated temporal filtering of successive pairs of pictures to supply low temporal frequency pictures and high temporal frequency pictures at different temporal decomposition levels. This analysis realizes, for a given temporal decomposition level and for a pair of low temporal frequency pictures, a motion estimation operation of a current picture B to a previous reference picture A to supply motion vectors then a motion compensated temporal filtering of these pictures to supply a low temporal frequency picture (L) and a high temporal frequency picture (H) at a greater decomposition level. The temporal filtering is replaced by an intra mode coding to obtain at least one low (L) or high (H) frequency picture if the current picture has a level of correlation with a previous picture lower than a threshold. The low frequency pictures (L) obtained is thus scaled to be adapted, at the energy level, to the pictures obtained by the motion compensated temporal filtering. Among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis, a selection operation selects the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding. A calibration operation calibrates the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding. For the reasons presented below, it is respectfully submitted that Turaga, when taken alone or in combination with Zhang, fails to teach or suggest each feature claimed in claim 1 of the present arrangement.

Turaga describes a method and device for encoding video. A first region in a first frame is matched to a second region in a second frame. A first partially encoded frame is produced including a difference between pixel values of the first and second region. A second partially encoded frame is produced including pixel values of either the first or second region. Further, the first and second partially encoded frame is transformed into wavelet coefficients (see Abstract).

The Office Action concedes that Turaga fails to teach or suggest "among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the

analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding" as recited in claim 1 of the present arrangement. Further, since the calibration operation is carried out for the selected picture, Turaga cannot have "a calibration operation to calibrate the selected pictures" because the prerequisite selection operation is missing in Turaga. Therefore, Turaga also does not teach or suggest "a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding" as recited in claim 1 of the present arrangement.

Turaga also fails to teach or suggest "the low frequency pictures (L) obtained being thus scaled to be adapted, at the energy level, to the pictures obtained by the motion compensated temporal filtering" as recited in claim 1 of the present arrangement. According to Turaga, L-regions of L-frames are scaled. The scaling taught by Turaga is applied to regions of frames independently of picture type. Therefore, Turaga does not teach or suggest that "the low frequency pictures (L) obtained being thus scaled." Additionally, unlike the present claimed arrangement, the scaling factor taught by Turaga is applied to L-regions, i.e. filtered regions. However, according to claim 1, the low frequency pictures scaled are those obtained by intra-mode coding in order for these pictures "to be adapted, at the energy level, to the pictures obtained by the said motion compensated temporal filtering." Therefore, Turaga also does not teach or suggest "the low frequency pictures (L) obtained being thus scaled to be adapted, at the energy level, to the pictures obtained by the motion compensated temporal filtering" as recited in claim 1 of the present arrangement.

The Office Action cites Zhang to show that redundancy in intra coded pictures is exploited in wavelet coding. Appellants respectfully disagree. Appellants submit that Zhang does not cure the deficiencies present in Turaga.

Zhang describes a wavelet based multiresolution video representations generated by multi-scale motion compensated temporal filtering (MCTF) and spatial wavelet transform. A new family of video decomposition processes utilize subband MCTF to generate multi-scale

representations along the temporal direction. Since MCTF is performed subband by subband, motion vectors are available for reduced spatial resolutions, thus facilitating the support of spatial scalability by video coders that use the multiresolution representation in video coding (see Abstract and column 2, lines 13-23).

However, Zhang, similar to Turaga, fails to teach or suggest "among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding" as recited in claim 1 of the present arrangement. Zhang simply teaches general features of wavelet coding (see Zhang, col. 6 lines 45-53). However, unlike the present claimed arrangement, no selection step is disclosed at all. Zhang is silent regarding the additional condition for high frequency picture that this picture is derived from an intra coding in order to be selected. Specifically, Zhang does not teach or suggest "a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding" as recited in claim 1 of the present arrangement. Zhang merely uses a very general expression "intra-band/inter-band redundancy". Page 5 of the Office Action refers to redundancy in intra coded picture, but Zhang is silent on intra coded pictures. Therefore, Zhang, similar to Turaga, fails to teach or suggest "among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding" as recited in claim 1 of the present arrangement.

Zhang, similar to Turaga, also fails to teach or suggest "a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding" as recited in claim 1 of the present arrangement. Even if Zhang describes that redundancy in intra coded pictures is exploited in wavelet coding, Appellants respectfully submit that the claimed selection operation among the high and low frequency

pictures obtained at the end of the analysis for selecting pictures obtained by intra coding does not serve the purposes for exploiting redundancy in intra coded pictures by wavelet coding. Rather, the selected pictures in the present claimed arrangement are selected for carrying out in a calibration operation at least one reverse operation of a scaling operation, for calibrating the selected pictures for their coding. Additionally, as discussed above, Zhang does not teach or suggest a selection operation to select low or high frequency pictures obtained by intra coding of a picture. Therefore, Zhang, similar to Turaga, does not teach or suggest "among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding, and a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding" as recited in claim 1 of the present arrangement.

Additionally, the combination of Turaga and Zhang, similar to the individual systems, neither teaches nor suggests the features of the present claimed arrangement. Specifically, the combination of Turaga and Zhang, as discussed above, similar to the individual systems, neither teaches nor suggests "among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding" as recited in claim 1 of the present arrangement. The combination of Turaga and Zhang, similar to the individual systems, also fails to teach or suggest "a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding" as recited in claim 1 of the present arrangement. Therefore, the combination of Turaga and Zhang does not teach or suggest the scaling of low frequency pictures obtained by intra-coding to be adapted, at the energy level, to the pictures obtained by motion compensated temporal filtering.

Therefore, as Turaga, alone or in combination with Zhang, fails to teach or suggest each feature claimed in claim 1, Appellants respectfully submit that Turaga and Zhang, alone or in

combination, do not make claim 1 of the present arrangement unpatentable. Thus, it is further respectfully submitted that a valid prima facie case of obviousness has not been made and the rejection of claim 1 under 35 U.S.C. § 103(a) is improper and should be reversed.

Claims 2-8 and 11 are dependent on claim 1 and are considered patentable for the reasons presented above with respect to claim 1. Thus, it is respectfully submitted that the rejection of claims 2-8 and 11 is improper and should be reversed.

<u>CLAIMS 9, 10 and 12</u>

Claims 1-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Turaga in view of Zhang. As claims 9, 10 and 12 were also rejected under 35 U.S.C. § 102(e) as being anticipated by Turaga, Appellants believe the further rejection of claims 9, 10 and 12 under 35 U.S.C. § 103(a) rejection to be in error as claims 9, 10 and 12 are not discussed in the body of this rejection. In any event, for completeness, arguments distinguishing claims 9, 10 and 12 over the combination of Turaga and Zhang are provided hereinafter.

Independent claim 9 provides a decoding method for a sequence of coded images. The coding realizes an intermediate operation of hierarchical temporal analysis of the motion compensated temporal filtering (MCTF) type providing high frequency and low frequency pictures for their coding. The method includes a decoding operation giving high frequency and low frequency decoded pictures. At least one reverse calibration operation for pictures is selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations is dependent on an element of information associated with the coded picture, to provide pictures to synthesize. A temporal synthesis operation for decoded pictures is not selected, said pictures to synthesize. For the reasons presented below, it is respectfully submitted that Turaga, when taken alone or in combination with Zhang, fails to teach or suggest each feature claimed in claim 9 of the present arrangement.

Turaga describes a method and device for encoding video. A first region in a first frame is matched to a second region in a second frame. A first partially encoded frame is produced including a difference between pixel values of the first and second region. A second partially

encoded frame is produced including pixel values of either the first or second region. Further, the first and second partially encoded frame is transformed into wavelet coefficients (see Abstract).

However, unlike the present claimed arrangement, Turaga fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement. The Office Action concedes that Turaga does not specifically disclose a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding. Since the calibration operation is carried out for the selected picture, Turaga cannot have a calibration operation for a picture selected because the prerequisite selection operation is missing in Turaga. Therefore, Turaga does not teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures" as recited in claim 9 of the present arrangement.

Furthermore, Turaga is related to wavelet based coding utilizing motion compensated temporal filtering that produces L-frames with both filtered and unfiltered regions (see Turaga, paragraph [0002]). A first region of a first frame is matched to a second region in a second frame, and a first partially encoded frame is produced including a difference between pixel values of the first and the second region. A second partially encoded frame is produced including pixel values of either the first or the second region (see Turaga, paragraph [0007]). In order to produce a L-frame, Turaga describes a temporal filtering unit which determines for each of the two corresponding matched regions in each pair of frames whether it should be an unfiltered A-region or should be filtered as a L-region. For each of the two corresponding matched regions that is determined to be a L-region, the temporal filtering unit calculates the average of the pixel values of the two regions. According to Turaga, the average of these two regions may be multiplied by a scaling factor, for example, the square root of two (see Turaga, paragraph [0025]).

Thus, according to Turaga, L-regions of L-frames are scaled. The scaling taught by Turaga is applied to regions of frames, independently of picture type. Therefore, Turaga does not teach or suggest a calibration operation for selected pictures.

In addition, cited paragraphs [0040] – [0042] of Turaga state:

> An inverse temporal filtering unit 22 is included to reconstruct the partially decoded frames from the spatial recomposition unit 20. During operation, the inverse temporal filtering unit 22 processes each pair of H and L-frames included in each GOP, as follows. First, corresponding regions in each pair of H and L-frames are retrieved according to the motion vectors and frame numbers provided by the entropy decoding unit 16. According to the present invention, each of the corresponding regions retrieved will include either an L-region or a A-region from an L-frame and a region from an H-frame. As previously described, the A-region represents the unfiltered pixel values of one of two corresponding matched regions between a pair of frames, the L-region represents the average of pixel values of the two corresponding matched regions and the region from the H-frame represents the difference between the two corresponding matched regions. Further, each of the retrieved corresponding regions are divided by the same scaling factor used on the encoder side.
> For each L-region included in the L-frames, a sum and difference is calculated for the pixel values of each L-region and the corresponding region in the H-frame. Each sum and difference is then divided by another scaling factor. An example of a suitable scaling factor would be a value of two (2). Each scaled sum and difference is then placed in the appropriate reconstructed frame.
> For each A-region included in the L-frames, it will be passed along unchanged to the appropriate reconstructed frame after being initially scaled, as described above. As previously described, each L-frame may have an associated header or flag that indicates whether a particular A-region was selected from either a reference frame or source frame. Thus, each A-region may be placed in the appropriate reconstructed frame according to the information in the associated header or flag. Alternatively, the A-region may be placed in the appropriate frame according to a predetermined convention. For example, it could be decided to select all A-regions from a reference frame for the whole video sequence.

Turaga describes a single scaling operation applying the same scaling factor to A-regions and two scaling operations applying the same scaling factor, for example, a value of two (2), to sums and differences calculated for pixel values of each L-region comprised in the L-frame and the corresponding region in the H-frame. Although Turaga describes that each L-frame may have an

associated header or flag that indicates whether a particular A-region was selected from either a reference frame or source frame, such information is only related to which reconstruction frame to place in the A-region. Turaga does not teach or suggest that the number of operations depends on the information in the associated header or flag. Since Turaga does not disclose a selection operation as discussed above, the selection of pictures would not be dependent on an element of information associated with the coded picture. Therefore, Turaga fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

In response to Applicant's arguments submitted in the prior response filed February 17, 2011 and discussed above, the present Office Action merely re-asserts paragraph [0040] of Turaga. The present Office Action argues that Turaga describes "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures" as recited in claim 9 of the present arrangement. Specifically, the present Office Action argues that because in Turaga, only L frames may contain L regions or A regions, the initial selection is between L frames and H frames, with further calibration if the frame selected is an L frame. Appellants respectfully disagree. Indeed, paragraph [0040] of Turaga defines "retrieved regions" as including "either an L-region or an A-region from an L-frame and a region from an H-frame". However, these retrieved regions are scaled (see Turaga, last sentence of paragraph [0040]: "retrieved region are divided by the same scaling factor"). Therefore, regions from an H-frame are also scaled since they are retrieved regions. Consequently, contrary to the assertion in the present Office Action, the scaling is applied to both regions of L and H-frames and not only if the selected frame is an L-frame. Therefore, Turaga fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures" as recited in claim 9 of the present arrangement.

Further, the present Office Action re-asserts that paragraph [0040] of Turaga describes that Turaga does look at pictures in the frames (see Turaga, paragraph [0040]: "During operation, the inverse temporal filtering unit processes each pair of H and L-frames included in each

GOP...""). Appellants respectfully disagree. The cited passage does not teach any scaling step. In addition, the last sentence of paragraph [0040] mentions explicitly that "each of the retrieved corresponding <u>regions are divided by the same scaling factor</u> used on the encoder side." This confirms that the scaling factor taught by Turaga is applied on regions and not to pictures. Therefore, Turaga does not teach or suggest a calibration operation for pictures selected.

In addition, the present Office Action re-asserts paragraphs [0040] and [0042] of Turaga arguing that Turaga describes that the number of operations depends on the information in the associated header or flag and therefore would be dependent on an element of information associated with the coded picture. Specifically, the present Office Action argues that because in Turaga, only L frames may contain L regions or A regions and the A region may be placed in the associated header or flag and since processing the A region requires the extra scaling operation, the selection of the pictures and the number of reverse operations are indeed dependent on an element of information associated with the coded picture in Turaga. Appellants respectfully disagree. The present Office Action does not show that Turaga teaches several reverse calibration steps. Paragraph [0042] simply discloses that each L-frame may have an associated <u>header or flag that indicates whether a particular A-region was selected from either a reference frame or a source frame</u>". This sentence does not state that the A-region is placed in the header or flag. The header or flag in Turaga simply comprises an indication related to A-region but not the region itself. The A-region is clearly not in the header or flag. Therefore, Turaga fails to teach or suggest "the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

Appellants submit that Zhang does not cure the deficiencies present in Turaga.

Zhang describes a wavelet based multiresolution video representations generated by multi-scale motion compensated temporal filtering (MCTF) and spatial wavelet transform. A new family of video decomposition processes utilize subband MCTF to generate multi-scale representations along the temporal direction. Since MCTF is performed subband by subband, motion vectors are available for reduced spatial resolutions, thus facilitating the support of

spatial scalability by video coders that use the multiresolution representation in video coding (see Abstract and column 2, lines 13-23).

However, Zhang, similar to Turaga, fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement. Zhang simply teaches general features of wavelet coding (see Zhang, col. 6 lines 45-53). However, unlike the present claimed arrangement, no selection step is disclosed at all. Zhang is silent regarding the additional condition for high frequency picture that this picture is derived from an intra coding in order to be selected. Specifically, Zhang does not teach or suggest a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding. Zhang merely uses a very general expression "intra-band/inter-band redundancy". Page 5 of the Office Action refers to redundancy in intra coded picture, but Zhang is silent on intra coded pictures. Therefore, Zhang, similar to Turaga, fails to teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

In addition, Zhang also fails to teach or suggest a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding. Even if Zhang describes that redundancy in intra coded pictures is exploited in wavelet coding, Appellants respectfully submit that the claimed selection operation among the high and low frequency pictures obtained at the end of the analysis for selecting pictures obtained by intra coding does not serve the purposes for exploiting redundancy in intra coded pictures by wavelet coding. Rather, the selected pictures in the present claimed arrangement are selected for carrying out in a calibration operation at least one reverse operation of a scaling operation, for calibrating the selected pictures for their coding. Additionally, as discussed above, Zhang does not teach or suggest a selection operation to select low or high frequency pictures obtained by intra coding of

a picture. Therefore, Zhang, similar to Turaga, does not teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

Additionally, the combination of Turaga and Zhang, similar to the individual systems, neither teaches nor suggests the features of the present claimed arrangement. Specifically, the combination of Turaga and Zhang, as discussed above, similar to the individual systems, neither teaches nor suggests "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement.

Therefore, as Turaga, alone or in combination with Zhang, fails to teach or suggest each feature claimed in claim 9, Appellants respectfully submit that Turaga and Zhang, alone or in combination, do not make claim 9 of the present arrangement unpatentable. Thus, it is further respectfully submitted that a valid prima facie case of obviousness has not been made and the rejection of claim 9 under 35 U.S.C. § 103(a) is improper and should be reversed.

Claims 10 and 12 are dependent on claim 9 and are considered patentable for the reasons presented above with respect to claim 9. Thus, it is respectfully submitted that the rejection of claims 10 and 12 is improper and should be reversed.

In view of the above remarks, it is respectfully submitted that the Office Action fails to make a prima facie case that the present claimed arrangement as claimed in claims 1-12 is obvious over Turaga, alone or in combination with Zhang. Therefore, as combination fails to teach or suggest each feature claimed, it is respectfully submitted that this rejection is improper and should be reversed.

VIII. CONCLUSION

Turaga and Zhang, when taken alone or in combination, do not teach or suggest "at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture" as recited in claim 9 of the present arrangement. As claims 10 and 12 are dependent on claim 9, these claims are also allowable over Turaga and Zhang, for reasons stated in conjunction with the allowability of claim 9.

Turaga and Zhang, when taken alone or in combination, do not teach or suggest that "among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding" and "a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding" as recited in claim 1 of the present arrangement. As claims 2-8 and 11 are dependent on claim 1, these claims are also allowable over Turaga and Zhang, for reasons stated in conjunction with the allowability of claim 1.
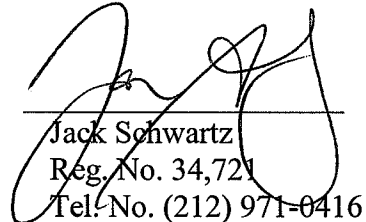
Accordingly it is respectfully submitted that the rejection of claims 1-12 should be reversed.

Respectfully submitted,
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APPENDIX I - APPEALED CLAIMS

1. (Rejected) A method for coding a picture sequence comprising a hierarchical temporal analysis of a group of pictures performing a motion compensated temporal filtering of successive pairs of pictures to supply low temporal frequency pictures and high temporal frequency pictures at different temporal decomposition levels, this analysis realizing, for a given temporal decomposition level and for a pair of low temporal frequency pictures, a motion estimation operation of a current picture B to a previous reference picture A to supply motion vectors then a motion compensated temporal filtering of these pictures to supply a low temporal frequency picture (L) and a high temporal frequency picture (H) at a greater decomposition level, the temporal filtering being replaced by an intra mode coding to obtain at least one low (L) or high (H) frequency picture if the current picture has a level of correlation with a previous picture lower than a threshold, the low frequency pictures (L) obtained being thus scaled to be adapted, at the energy level, to the pictures obtained by the motion compensated temporal filtering, the method comprising,

among the low frequency picture and the final high frequency decomposed pictures obtained at the end of the analysis: a selection operation to select the low (L) or high (H) frequency pictures obtained by intra coding of a picture at a lower decomposition level with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding, and

a calibration operation to calibrate the selected pictures by carrying out at least one reverse operation of the scaling operation, for their coding.

2. (Rejected) The method according to claim 1, wherein the number of reverse operations carried out corresponds to the number of successive intra coding operations of a low frequency picture (L) to arrive at the picture selected if this involves a low frequency selected picture, this number being decreased by one if it involves the high frequency selected picture (H).

3. (Rejected) The method according to claim 1, comprising, for the calculation of a low L or high H frequency image at a given temporal level, a temporal filtering between the current picture and a following picture of the following pair of pictures of the lower temporal level, if the correlation between the current picture and the previous picture is lower than a threshold and if

the correlation between the current picture and this following picture is greater than a threshold, the other H or L picture of the given temporal level being obtained by intra coding, this filtering operation being assimilated with the intra coding and not with the temporal filtering for the selection operation.

4. (Rejected) The method according to claim 1, comprising: assigning a picture number to each picture of the group of pictures, and monitoring these numbered pictures during the decomposition by attributing a counter for each number, this counter being updated as follows:

the counter is increased each time a low frequency picture (L) is obtained in intra mode,

the counter remains unchanged each time a high frequency picture (H) is obtained in intra mode or during a temporal filtering with a following picture,

the counter is reset each time a picture is obtained by motion compensated temporal filtering with a previous picture,

the reverse operations being carried out according to the value of the counters.

5. (Rejected) The method according to claim 1, wherein the high frequency pictures H and low frequency pictures L are obtained, during the motion compensated temporal filtering of two successive pictures A and B, from the following operations:

$$\begin{cases} H = \dfrac{B - MC_{A \leftarrow B}(A)}{\sqrt{2}} \\ L = \sqrt{2}.A + MC^{-1}_{A \leftarrow B}(H) \end{cases}$$

MC corresponding to the motion compensation according to the B to A motion vector field, of the picture A or H,

and wherein the pictures L and H are obtained, from intra coding, according to the formulas

$$\begin{cases} H = B \\ L = \sqrt{2}.A \end{cases}$$

6. (Rejected) The method according to claim 3, wherein the pictures H and L are obtained by filtering with the following picture for H and by intra coding for L, according to the following formulas:

$$\begin{cases} H = \dfrac{B - MC_{B \to C}(C)}{\sqrt{2}} \\ L = \sqrt{2}.A \end{cases}$$

MC corresponding to the motion compensation according to the B to C motion vector field, of the picture C.

7. (Rejected) The method according to claim 1, wherein the calibrated pictures obtained by temporal analysis are then processed by spatial analysis.

8. (Rejected) The method according to claim 1, wherein the level of correlation is calculated by taking into account the number of connected pixels, that is, connected by a motion vector.

9. (Rejected) A decoding method for a sequence of coded images, the coding realizing an intermediate operation of hierarchical temporal analysis of the motion compensated temporal filtering (MCTF) type providing high frequency and low frequency pictures for their coding, the method comprising:

a decoding operation giving high frequency and low frequency decoded pictures,

at least one reverse calibration operation for pictures selected from the high and low frequency decoded pictures, the selection of the pictures and the number of reverse operations being dependent on an element of information associated with the coded picture, to provide pictures to synthesize, and

a temporal synthesis operation from decoded pictures not selected and said pictures to synthesize.

10. (Rejected) The method according to claim 9, wherein the information associated with the coded picture is the value of a counter assigned to the picture during the coding.

11. (Rejected) A coder for the implementation of the method according to claim 1, comprising a temporal analysis circuit using the motion compensated temporal filtering and the intra coding, the circuit selecting, among the low frequency picture and the final high frequency decomposed pictures obtained at the end of analysis, the pictures obtained by an intra coding of a picture at the lower decomposition level, with the additional condition, for the high frequency pictures, that this picture is derived itself from an intra coding, and the circuit carrying out at least one scaling operation for the pictures selected.

12. (Rejected) A decoder for the implementation of the method according to claim 9, comprising a decoding circuit to provide high and low frequency decoded pictures and a temporal synthesis circuit of pictures to synthesize, also comprising means to perform a reverse calibration of selected high and/or low frequency decoded pictures to provide pictures to be synthesized, the selection of the pictures and the number of reverse calibrations being dependent on an element of information associated with the picture to decode, and received by the decoder.

APPENDIX II - EVIDENCE

Appellants do not rely on any additional evidence other than the arguments submitted hereinabove.

APPENDIX III - RELATED PROCEEDINGS

Appellants respectfully submit that there are no proceedings related to this appeal in which any decisions were rendered.

APPENDIX IV   -   TABLE OF CASES

1. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051 (Fed. Cir. 1987)

2. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)

3. *In re Wada and Murph*y, Appeal 2007-3733

4. *In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995)

5. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)

APPENDIX V   -   LIST OF REFERENCES

U.S. Pub. No.	Pub. Date	102(e) Date	Inventors
2004/0008785 A1	January 15, 2004		Turaga et al.

U.S. Patent No.	Issued Date	102(e) Date	Inventors
7,321,625 B2	January 22, 2008		Zhang et al.

TABLE OF CONTENTS